



# Dow Polyurethanes

Making a Difference Every Day

Automotive

Flooring  
Recreation

Furnishings

Package

Construction

Carpet Backing

Appliances

Bedding

## PRODUCT GUIDE

DOW POLYURETHANES

# Making a Difference for You

## Your Goals... Our Purpose

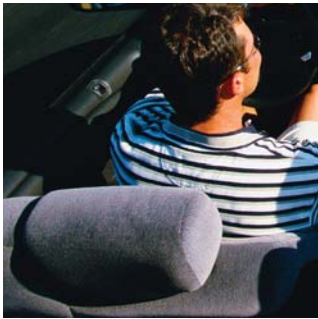
At Dow Polyurethanes, our goal is simple:

*To make a difference in everyday living, through the power of people, science products, and services.*

Through the power of polyurethanes (PU) chemistry, you possess the potential to create unlimited value within your industry. Dow Polyurethanes' global resources and expertise can help you design products that provide comfort, convenience, and safety.

Making a difference means more than being the largest global supplier of polyurethane materials. It also means having in-depth local market knowledge, providing exceptional quality, and responding efficiently to your needs. A commitment to innovation, combined with a long-term investment in the industry, makes Dow a leader in technology, safety, environmental awareness, and industry advancement.

We can make a difference!



# Products That Meet Your Specific Applications

By working closely with our customers to develop products that meet or exceed the demands of a variety of applications, Dow Polyurethanes has built one of the broadest product portfolios in the industry. As a global supplier of rigid and flexible foams, adhesives, sealants, coatings, elastomers, agrifibers – and more – we provide the right products and excellent service 24 hours a day, seven days a week.

In addition, Dow is the world's largest producer of polyether polyols, a leading supplier of quality aromatic isocyanates (e.g., MDI and TDI), and the world's largest producer of propylene oxide, an essential component of polyether polyols. We have the products and services you need to succeed in a variety of applications and markets, including:

- Appliances
- Automotive
- Bedding
- Biocomposite binders
- Carpet backing
- Construction
- Furniture
- Packaging
- Recreation

## Innovation That Makes a Difference to Your Bottom Line

If you want products and solutions that can make a difference in your business and to your customers, count on Dow Polyurethanes. As a pioneer in polyurethane technology, Dow is committed to developing innovative polyurethane applications that enrich the quality of life while improving your bottom line.

And by getting everything you need from just one supplier, you cut costs and save time.

### Enhancing safety and the environment

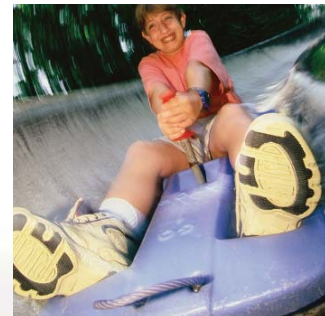
Committed stewardship and safe management of our world's resources are important global considerations that we take seriously. That's why Dow provides innovative solutions, including unique low volatile organic compound products/materials, and economically viable recycling options to help all our customers be a part of the environmental effort.

Dow also offers new technologies for making your business more efficient – and improving employee health and safety. Our technical support team is ready to assist you in developing new technologies and improving worker safety procedures.

### Making a difference with new ideas

If you're interested in exploring new growth opportunities and developing new ideas for polyurethanes, contact Dow. We'll work with you to develop new materials, applications, formulations, and processes that can differentiate your products and sharpen your competitive edge.

*For your convenience, information on specific Dow polyurethane materials for your applications is included in the pocket of this brochure.*



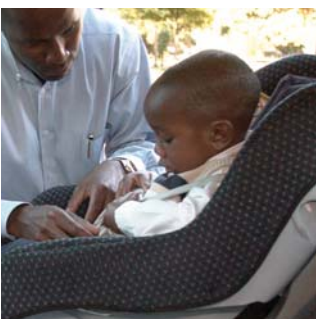
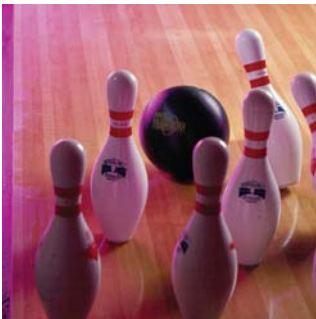
# Business Vision and Initiatives

## Customer Interface

Dow is constantly researching and finding innovative ways to leverage our existing expertise across new marketplaces, and in so doing, integrating electronic technology into everything we do – how we work, how we buy, how we sell, and how we'll grow.

As Dow embraces electronic technology, we are able to offer our customers value in the form of convenient new capabilities, efficiencies, and solutions.

- Around-the-clock availability of product information, resources, and contact information
- Easy access to product information and technical data sheets
- Immediate access to news about Dow innovations and new products



## Providing the Ultimate in Customer Convenience

MyAccount@Dow is a secure, customer-specific, interactive sales channel that offers online access to customer relationship information:

- Order entry
- Check the real-time status of any order you've placed in the last 90 days
- Order, sales, payment reports
- Purchase history
- Secure drop box for electronic file exchange
- Easy access to technical information, product information, and safety guidelines
- External net-meeting capability
- Flexible order-entry change or repeat orders, rather than re-entering them, with just a mouse-click
- EZ Pay-Electronic Funds Transfer (EFT) capabilities that allow you to pay invoices and receive credits electronically with options to track invoices

Available 24 hours a day, seven days a week and fully integrated into SAP for access to real-time global data, MyAccount@Dow acts as a direct channel for customer communication and collaboration. It dramatically expands the possibilities to enhance our existing customer relationships and expand our reach.

MyAccount@Dow is an upgrade in how we do business. It creates yet another choice for our customers, making it easier and more convenient to do business with Dow.

## Quality Policy

Quality performance is a commitment to excellence by each Dow employee. It is achieved by teamwork and a process of continuous improvement.

We are dedicated to being the leader in providing quality products and services that meet or exceed the expectations of our customers.

Quality management plays an important role by ensuring that Dow can produce and deliver the quality products and services expected by its customers.

## Six Sigma

In addition to a number of specific quality programs, Dow embraces Six Sigma in pursuit of business excellence. Six Sigma coordinates with and builds on other quality initiatives, with the goal of creating an environment in which anything less than Six Sigma quality is unacceptable.



Dow is one of the few premier companies that focuses on customers as the basis of its Six Sigma efforts. Our objective is to create customer loyalty based on Six Sigma level quality. The desired outcome is unparalleled business excellence.



## VORANATE T-80 TDI Products

VORANATE\* toluene diisocyanates are ideal for flexible slabstock and flexible molded foam applications. Choose from two types: low acidity (Type I), and high acidity (Type II).

Both VORANATE T-80 products are well suited for use in high resilience molding, TDI molding, formulating (systems), and flexible slabstock applications. And both are produced in accordance with exacting standards of quality and product purity.

\*Trademark of The Dow Chemical Company



# VORANATE T-80 TDI Products

## VORANATE T-80 Type I TDI

VORANATE T-80 (Type I) TDI may be used in automotive seating, furniture cushioning, mattress cushioning, and specialty foams applications.

Product	Weight % NCO	Function-ality	Isocyanate Equiv. Wt.	Flash Point <sup>(1)</sup> °F (°C)	Density lb/gal (g/cc)	Viscosity <sup>(2)</sup> @ 77°F	Viscosity @ 100°F	Viscosity @ 150°F	Viscosity @ 210°F
VORANATE T-80 (Type I)	48.2	2.0	87.1	260 (127)	10.2 (1.22)	2.5	2.2	1.3	1.0

**Note:** These are typical properties only, and are not to be regarded as sales specifications.

<sup>(1)</sup> PMCC

<sup>(2)</sup> Viscosity is measured in centistokes.

## VORANATE T-80 Type II TDI

High-acidity VORANATE T-80 (Type II) TDI is well suited for use in automotive seating, furniture applications, mattress cushioning, and specialty foams.

Product	Weight % NCO	Function-ality	Isocyanate Equiv. Wt.	Flash Point <sup>(1)</sup> °F (°C)	Density lb/gal (g/cc)	Viscosity <sup>(2)</sup> @ 77°F	Viscosity @ 100°F	Viscosity @ 150°F	Viscosity @ 210°F
VORANATE T-80 (Type II)	48.2	2.0	87.1	260 (127)	10.2 (1.22)	2.5	2.2	1.3	1.0

**Note:** These are typical properties only, and are not to be regarded as sales specifications.

<sup>(1)</sup> PMCC

<sup>(2)</sup> Viscosity is measured in centistokes.



## Dow MDI-Based Products

From high density foams, adhesives and sealants, elastomers and coating applications, Dow MDI-based isocyanate products can be used in a wide array of applications. Choose from ISONATE\* MDI polymers, or PAPI\* polymeric MDI products to meet your specific needs.

\*Trademark of The Dow Chemical Company



# Dow MDI-Based Products

## ISONATE MDI Isocyanates

ISONATE MDI isocyanates are characterized by their viscosity, purity, low acidity and reproducible reactivity. These functional products are key ingredients in preparing prepolymers for polyurethane processing. ISONATE MDI products are designed for the manufacture of thermoplastic polymers suitable for extrusion, injection molding, or solution applications in adhesives, sealants, and elastomers.

Product	Description	Weight % NCO	Function-ality	Isocyanate Equiv. Wt.	Flash Point <sup>(1)</sup> °F (°C)	Density lb/gal (g/cc)	Viscosity <sup>(2)</sup> @ 77°F	Viscosity @ 100°F	Viscosity @ 150°F	Viscosity @ 210°F
ISONATE 181	MDI prepolymer	23.0	2.0	182	>351 (>177)	10.2 (1.22)	770	300	70	30
ISONATE 240	MDI prepolymer	18.7	2.0	225	>351 (>177)	10.2 (1.22)	1,500	550	–	–
ISONATE 125M	Pure MDI	33.5	2.0	125.5	>351 (>177)	9.9 (1.18)	solid	5	2.8	1.5
ISONATE 125MDR	Pure MDI	33.5	2.0	125.5	>351 (>177)	9.85 (1.18)	solid	5	2.8	1.5
ISONATE 143L	Modified MDI	29.2	2.1	144.5	>351 (>177)	10.1 (1.21)	33	20	9	4
ISONATE 50 O,P'	Pure MDI	33.5	2.0	125.5	>351 (>177)	10.0 (1.20)	10	4.1	3.6	1.6

**Note:** These are typical properties only, and are not to be regarded as sales specifications.

<sup>(1)</sup> PMCC

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Consider ISONATE MDI products for these applications:

- Thermoplastic Polyurethanes
- Fibers
- Sealants
- Coatings
- Automotive Bumpers, Fenders, Fascia
- Integral-skin Plastics
- Tires and Wheels
- Industrial Wheels
- Shoe Soles
- Recreational Goods
- Mechanical Goods

## PAPI Polymeric MDI

Dow offers PAPI polymeric MDI products for a full range of low- to high-density semi-rigid foams, rigid foams, and structural RIM processing. They offer good resistance to heat distortion, and excellent strength properties at low densities.

Product	Description	Weight % NCO	Function-ality	Isocyanate Equiv. Wt.	Flash Point <sup>(1)</sup> °F (°C)	Density lb/gal (g/cc)	Viscosity <sup>(2)</sup> @ 77°F	Viscosity @ 100°F	Viscosity @ 150°F	Viscosity @ 210°F
PAPI 20	Polymeric MDI	30.4	3.2	138	>400 (>204)	10.4 (1.24)	1,800	1,000	420	–
PAPI 27	Polymeric MDI	31.4	2.7	134	>400 (>204)	10.3 (1.23)	180	65	18	7
PAPI 94	Polymeric MDI	32.0	2.3	131.5	>400 (>204)	10.2 (1.23)	50	26	–	–
PAPI 95	Polymeric MDI	31.5	2.3	133.5	>400 (>204)	10.2 (1.23)	85	40	10	–
PAPI 901	Polymeric MDI	31.8	2.3	132	>400 (>204)	10.2 (1.22)	55	27	9	3.5
PAPI 580N	Polymeric MDI	30.5	3.0	136.5	>400 (>204)	10.3 (1.24)	700	300	130	–

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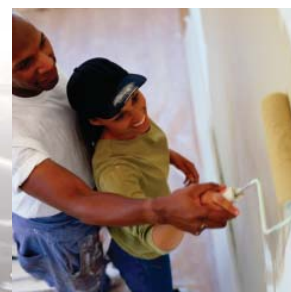
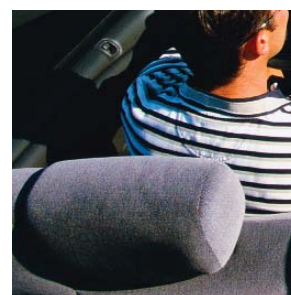
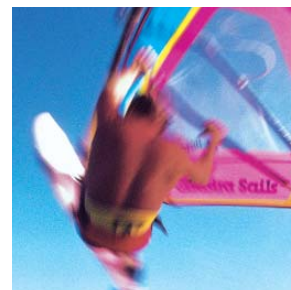
Choose PAPI polymeric MDI products for numerous applications, including:

- Automotive Interior Trim
- Automotive Seating
- Building
- Industrial
- Coatings
- Adhesives
- Packaging
- Structural Foam
- Pour-in-place Insulation
- Laminated Panel Cores
- Burnstock Polyisocyanurate
- Furniture



## VORANOL Polyether Polyols

Dow provides a wide variety of VORANOL\* polyether polyols with an extensive selection of performance and processing attributes. Designed to meet your needs, this large family of polyols is sure to provide the balance of properties needed within rigid and molded foam and isocyanate product formulations.



\*Trademark of The Dow Chemical Company



# VORANOL Polyether Polyols

## VORANOL Diol Polyether Polyols

The diol line of VORANOL polyether polyols are well suited for use in numerous applications, including microcellular reaction injection molding (RIM), prepolymers, sealants, and other polyol blends.

Product	OH Number	Functionality	Average Mol. Wt.	Initiator	Flash Point <sup>(1)</sup> °F (°C)	Density lb/gal (g/cc)	Viscosity <sup>(2)</sup> @ 77°F	Viscosity @ 100°F	Viscosity @ 150°F	Viscosity @ 210°F
VORANOL 220-028	28	2.0	4,000	propylene glycol	446 (230)	8.36 (1.00)	880	465	140	53
VORANOL 220-056N	56	2.0	2,000	propylene glycol	390 (199)	8.34 (1.00)	300	160	60	23
VORANOL 220-094	94	2.0	1,200	propylene glycol	435 (224)	8.43 (1.01)	175	92	31	13
VORANOL 220-110N	110	2.0	1,000	propylene glycol	360 (182)	8.37 (1.00)	160	80	28	11
VORANOL 220-260	260	2.0	432	propylene glycol	330 (165)	8.43 (1.01)	75	33	12	4.7
VORANOL 220-530	530	2.0	212	aniline	325 (163)	8.39 (1.00)	solid	6,000	200	13
VORANOL 222-029	29	2.0	4,000	propylene glycol	420 (216)	8.49 (1.02)	790	410	168	62
VORANOL 222-056	56	2.0	2,000	propylene glycol	>420 (>216)	8.46 (1.01)	321	168	63	25

**Note:** These are typical properties only, and are not to be regarded as sales specifications.

<sup>(1)</sup> PMCC

<sup>(2)</sup> Viscosity is measured in centistokes.

### Key to Six-Digit Product Numbers for VORANOL Polyether Polyols

#### First Cluster

First digit: 2 = elastomers, sealants, coatings, adhesives market areas

Second digit: Nominal functionality  
2 = Diol  
3 = Triol, etc.

Third digit: 0 = All P.O. (propylene oxide)  
1 = Less than 10% E.O. capped (ethylene oxide) capped  
2 = Less than 20% E.O. capped  
3 = Less than 30% E.O. capped  
4 = More than 30% E.O. capped  
5 = Internal E.O.

#### Second Cluster

Three digits: OH (hydroxyl) number

#### Example

VORANOL 220-056

- Used for elastomers
- Diol
- All propylene oxide
- Hydroxyl number of 56

## VORANOL Triol Polyether Polyols

Twenty-three different products comprise this family of triol polyether polyols. Choose from a broad range of molecular weights, viscosities, hydroxyl contents, densities, and flash points to better meet your specifications for polyurethane applications.

Product	OH Number	Functionality	Average Mol. Wt.	Initiator	Flash Point <sup>(1)</sup> °F (°C)	Density lb/gal (g/cc)	Viscosity <sup>(2)</sup> @ 77°F	Viscosity @ 100°F	Viscosity @ 150°F	Viscosity @ 210°F
VORANOL 225	673	3.0	250	glycerine	370 (188)	9.07 (1.016)	850	285	40	11
VORANOL 230-056	56	3.0	3,000	glycerine	440 (227)	8.43 (1.01)	475	235	77	28
VORANOL 230-112	112	3.0	1,500	glycerine	350 (177)	8.46 (1.01)	297	135	43	17
VORANOL 230-238	238	3.0	700	glycerine	500 (260)	8.59 (1.03)	238	90	29	10
VORANOL 230-660	673	3.0	250	glycerine	370 (188)	9.07 (1.02)	850	210	46	11
VORANOL 232-027	28	3.0	6,000	glycerine	435 (224)	8.48 (1.01)	1,180	640	220	86
VORANOL 232-034	34	3.0	4,900	glycerine	365 (185)	8.49 (1.01)	860	435	147	61
VORANOL 232-035	34	3.0	4,900	glycerine	435 (224)	8.45 (1.02)	860	440	140	52
VORANOL 235-056	56	3.0	3,000	glycerine	430 (221)	8.45 (1.012)	450	225	90	38
VORANOL 270	238	3.0	700	glycerine	500 (260)	8.59 (1.03)	238	90	29	10
VORANOL 271	34	3.0	4,900	glycerine	365 (185)	8.49 (1.02)	860	435	147	61
VORANOL 280	280	7.0	1,402	sucrose/ glycerine	380 (193)	9.17 (1.009)	3,311	1,055	190	50
VORANOL 415	28	3.0	6,000	glycerine	435 (224)	8.48 (1.01)	1,180	640	220	86
VORANOL 550	541-564	4.9	500	sucrose/ glycerine	320 (160)	9.54 (1.143)	29,000	6,900	775	91
VORANOL 3010	56.5	3.0	3,000	glycerine	430 (221)	8.45 (1.01)	475	250	87	33
VORANOL 3136	54	3.0	3,100	glycerine	>392 (>200)	8.48 (1.02)	460	250	85	34
VORANOL 3512A	48	3.0	3,500	glycerine	449 (232)	8.48 (1.02)	555	285	97	40

**Note:** These are typical properties only, and are not to be regarded as sales specifications.

<sup>(1)</sup>PMCC

<sup>(2)</sup>Viscosity is measured in centistokes.

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## VORANOL Triol Polyether Polyols – continued

Product	OH Number	Functionality	Average Mol. Wt.	Initiator	Flash Point <sup>(1)</sup> °F (°C)	Density lb/gal (g/cc)	Viscosity <sup>(2)</sup> @ 77°F	Viscosity @ 100°F	Viscosity @ 150°F	Viscosity @ 210°F
VORANOL 4701	34	3.0	4,900	glycerine	365 (185)	8.49 (1.02)	860	435	147	61
VORANOL 4703	34	3.0	4,900	glycerine	435 (224)	8.45 (1.02)	860	440	140	52
VORANOL 5815	28	3.0	6,000	glycerine	435 (224)	8.48 (1.02)	1,180	640	220	86

**Note:** These are typical properties only, and are not to be regarded as sales specifications.

<sup>(1)</sup>PMCC

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### Key to Six-Digit Product Numbers for VORANOL Polyether Polyols

#### First Cluster

First digit: 2 = elastomers, sealants, coatings, adhesives market areas

Second digit: Nominal functionality  
2 = Diol  
3 = Triol, etc.

Third digit: 0 = All P.O. (propylene oxide)  
1 = Less than 10% E.O.  
(ethylene oxide) capped  
2 = Less than 20% E.O. capped  
3 = Less than 30% E.O. capped  
4 = More than 30% E.O. capped  
5 = Internal E.O.

#### Second Cluster

Three digits: OH (hydroxyl) number

#### Example

VORANOL 220-056  
• Used for elastomers  
• Diol  
• All propylene oxide  
• Hydroxyl number of 56

For additional information about Dow Polyurethanes, including specific product data sheets, safety & handling guidelines, or Material Safety Data (MSD) sheets, contact The Dow Chemical Company Customer Information Group for your area:

U.S. and Canada: 1-800-441-4DOW(4369)

Mexico: 00-52-5-201-4700

Latin America: 55-115-1889-222

Europe: 32-3-450-2240

Pacific: 60-3-7958-3392

Brazil: 55-115-1889-222

[www.polyurethanes.com](http://www.polyurethanes.com)

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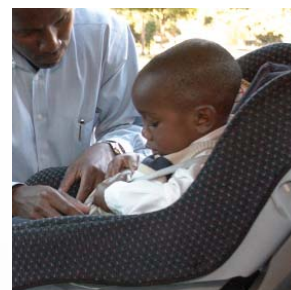
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Improved daily.



## Specialty Polyether Polyols

The specialty line of VORANOL\*, VORALUX\* and SPECFLEX\* polyether polyols gives you a wide variety of functionalities, offering sucrose/glycerine-initiated products, amine-initiated products, and copolymer polyols designed to meet the exacting requirements of your foam applications.

\*Trademark of The Dow Chemical Company



# Specialty Polyether Polyols

## Sucrose/Glycerine-Initiated Products

The large family of sucrose/glycerine-initiated VORANOL polyether polyols offers numerous differentiated products to meet your specific needs for rigid and molded foam applications.

SPECFLEX polyether polyols are designed for high-resilience seat cushions, low-density backrests, and other molded foam uses.

Product	OH Number	Functionality	Average Mol. Wt.	Initiator	Flash Point <sup>(1)</sup> °F (°C)	Density lb/gal (g/cc)	Viscosity <sup>(2)</sup> @ 77°F	Viscosity @ 100°F	Viscosity @ 150°F	Viscosity @ 210°F
VORANOL 280	280	7.0	1,380	sucrose/glycerine	380 (193)	9.19 (1.10)	3,310	1,060	172	50
VORANOL 360	360	4.5	728	sucrose/glycerine	325 (163)	9.05 (1.08)	3,600	1,310	170	37
VORANOL 370	370	7.0	1,040	sucrose/glycerine	335 (168)	9.27 (1.11)	30,580	6,550	614	97
VORANOL 446	446	4.5	566	sucrose/glycerine	375 (191)	9.25 (1.11)	6,510	1,820	270	41
VORANOL 490	490	4.3	460	sucrose/glycerine	380 (193)	9.26 (1.11)	5,500	1,800	210	37
VORANOL 520	520	5.1	550	sucrose/glycerine	390 (199)	9.4 (1.13)	36,000	7,500	630	100
VORANOL 550	541-564	4.9	500	sucrose/glycerine	320 (160)	9.54 (1.143)	29,000	6,900	775	91
SPECFLEX NC 630	31	—	—	sucrose/glycerine	400 (204)	8.63 (1.03)	1,250	605	200	—

**Note:** These are typical properties only, and are not to be regarded as sales specifications.

<sup>(1)</sup>PMCC

<sup>(2)</sup>Viscosity is measured in centistokes.

## Amine-Initiated Products

Amine-initiated VORANOL polyether polyols may be utilized in a wide variety of applications, including rigid foams and cast elastomers. Choose from a useful assortment of functionalities, molecular weights, hydroxyl contents, viscosities, and densities to match your requirements.

Product	OH Number	Functionality	Average Mol. Wt.	Initiator	Flash Point <sup>(1)</sup> °F (°C)	Density lb/gal (g/cc)	Viscosity <sup>(2)</sup> @ 77°F	Viscosity @ 100°F	Viscosity @ 150°F	Viscosity @ 210°F
VORANOL 391	391	4.0	575	aromatic amine	425 (218)	9.06 (1.09)	4,740	1,290	48	29
VORANOL 800	800	4.0	278	aliphatic amine	405 (207)	8.75 (1.05)	17,310	3,550	270	40

**Note:** These are typical properties only, and are not to be regarded as sales specifications.

<sup>(1)</sup>PMCC

<sup>(2)</sup>Viscosity is measured in centistokes.

## Copolymer Polyols

VORANOL and SPECFLEX copolymer polyols are most often used in such flexible foam applications as furniture arm rests, seat cushions, and automotive seating.

Product	OH Number	Functionality	Average Mol. Wt.	Initiator	Flash Point <sup>(1)</sup> °F (°C)	Density lb/gal (g/cc)	Viscosity <sup>(2)</sup> @ 77°F	Viscosity @ 100°F	Viscosity @ 150°F	Viscosity @ 210°F
SPECFLEX NC 700	21.5	–	–	glycerine/ SAN	335 (169)	8.77 (1.05)	5,500	–	–	–
VORANOL 3943A	31	–	–	glycerine/ SAN	335 (169)	8.70 (1.04)	5,300 cp	1,500 cp	774 cp	295 cp
VORALUX HL430	31	–	–	glycerine/ SAN	335 (169)	8.70 (1.04)	7,250	3,560	1,090	450

**Note:** These are typical properties only, and are not to be regarded as sales specifications.

<sup>(1)</sup>PMCC

<sup>(2)</sup>Viscosity is measured in centistokes unless otherwise noted as cp for centipoise.

For more information, contact The Dow Chemical Company Customer Information Group for your area:

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Pacific: 60-3-7958-3392

Brazil: 55-115-1889-222

[www.polyurethanes.com](http://www.polyurethanes.com)

The Dow Chemical Company, 2040 Dow Center, Midland, Michigan 48674

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